A NEW CAVERNICOLOUS SHRIMP IN *PYCNISIA* BRUCE, 1992 (CRUSTACEA: DECAPODA: CARIDEA: ATYIDAE) FROM NORTHWESTERN QUEENSLAND

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A new cavernicolous shrimp, *Pycnisia bunyip*, is described from Forbes Inferno Cave, Riversleigh, Lawn Hill National Park, northwestern Queensland. *Pycnisia* is differentiated from all other atyid genera by its robust pereiopods 3-4. *Pycnisia bunyip* is distinguished from the only known congener, *Pycnisia raptor* Bruce, by the shape of the rostrum and telson. This is the seventh species of troglophilic atyid from Australia. ❐ *Pycnisia, Atyidae, Caridea, Queensland, new species, troglobite.*

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The first Australian subterranean shrimp was described in 1960, and another five species have been described in indigenous *Stygiocaris* Holthuis, 1960, *Parisia* Holthuis, 1956, *Pycneus* Holthuis, 1986, and *Pycnisia* Bruce, 1992. All have so far been found only in wells or caves in northwestern Australia. These troglophilic shrimps have reduced eyes without pigments, and no carapace spines (except for an antennal spine in *Stygiocaris*). The previously monotypic *Pycnisia* was established for *P. raptor* because of its unique remarkably robust pereiopods. *Pycnisia bunyip* sp. nov. is the seventh species of troglophilic atyid from Australia.

Reproductive isolation leading to incipient speciation can be expected to occur amongst freshwater crustaceans occurring in widely isolated freshwater cave systems. During surveys of the Forbes Inferno Cave, Riversleigh, Lawn Hill National Park, northwestern Queensland, conducted in 1993 and 1994, unusual specimens of a *Pycnisia* species were found. The shape of the rostrum, and structure of the telson of these shrimps indicate that they represent a new species that is herein described and illustrated.

The types are deposited in the Queensland Museum, Brisbane (QM). Measurements are of post-orbital carapace length in millimeters (mm).

SYSTEMATICS

Family AYIDAE De Haan, 1849
Genus **Pycnisia** Bruce, 1992
Pycnisia bunyip sp. nov.
(Figs 1-4)

MATERIAL. Holotype: QMW26722, ♀ (7.0mm), Forbes Inferno Cave, Riversleigh, Lawn Hill National Park, northwestern Queensland, in shallow subterranean pools, S. Williams and B. Ehrlich, 22/6/1994. Paratypes: QMW26723, ♀ (2.6mm), data as for holotype. QMW26724, ♀ (specimen damaged), data as for holotype. QMW26725, ♀ (6.2mm,), same location, coll. S. Williams, 14/6/1993. QMW26725, ♀ (3.7mm,), data as for preceding specimen.

ETYMOLOGY. A mythical predatory creature said to live in Australian freshwater pools. A noun in apposition.

DIAGNOSIS. Rostrum small, short, reaching to only half length of eyes, but projecting beyond level of inferior orbital angle. Eyes reduced, pyriform, lacking pigment. Telson with one pair of dorsal spines (2 pairs in paratypes) and one pair of sub-dorsal spines, 7 spines (6-8 in paratypes) on posterior margin. Pereiopods 1-5 with 1, 1, 1, 1 and 2 setobranchs, respectively.

DESCRIPTION. Small species (postorbital carapace length <7.0mm), but largest recorded Australian troglophilic atyid species. Carapace thin, flexible, smooth, without spines or setae (Fig. 1); rostrum small, acute, with short, faint, dorsal ridge, reaching beyond level of inferior orbital angles to half length of eyes (Figs 1, 2A-B, 3M); pteryogstomian angle broadly rounded (Fig. 2B).

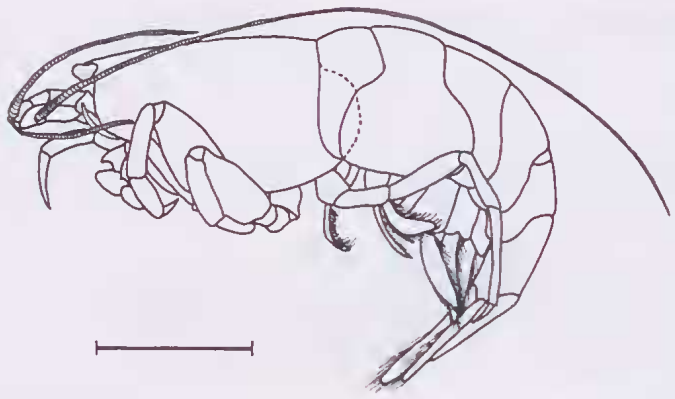

FIG. 1. *Pycnisia bunyip*, sp. nov., ♀ holotype (QMW26722), lateral view. Scale bar = 5mm.

Abdomen smooth, pleura of abdominal somites 1-5 rounded (Fig. 1). Telson slightly shorter than sixth abdominal somite, rectangular, with 1 pair of dorsal spines (2 pairs or 4 irregularly arranged dorsal telsonic spines on paratypes) and 1 pair of small subdorsal spines near posterolateral corner (Figs 2C, 3N,O); dorsal spines placed slightly behind middle of telson, second pair, if present, placed close to posterolateral margin (Fig. 3N,O); posterior margin broad, faintly biconvex, with 7 plumose and 5 simple setae (6-8 plumose setae in paratypes).

Eyes reduced, pyriform, devoid of pigment, cornea rounded (faint papilla on tip of eyes in small specimen with postorbital carapace length of 2.6 mm) (Figs 1, 2A-B, 3M).

Antennular peduncle stout, slightly exceeding distal margin of scaphocerite (Figs 2A, 3A,M); proximal segment broad, with stylocerite acute, laterally divergent, reaching beyond middle of proximal segment, outer anterolateral angle weakly forwardly produced (acutely produced in young paratype), medial margin relatively straight; intermediate and distal segments subcylindrical, medial margins setose; antennular flagella slender, subequal.

Antennal scaphocerite (Figs 2A, 3C,M) well developed, broad; outer margin with large broad acute distolateral tooth; inner margin convex; bluntly rounded distally; antennal peduncle (Fig. 3B) without spines; flagellum long (Fig. 1), distinctly longer than whole body length.

Mouthparts similar to *P. raptor*. Mandible without palp (Fig. 3D-E); molar process small, ocelusal surface with marginal setal fringe; incisor process short, broad, with 4 stout marginal teeth. Maxillula with slender palp, with several setae distally (Fig. 3F); upper lacinia narrow, with numerous short spinules on inner and distal margins; lower lacinia subrectangular with short setae on inner margin. Maxilla (Fig. 3G) with slender palp concealed behind endites, basal endite, coxal endite, and scaphognathite having 20 multidenticulate long setae on posterior end. First maxilliped (Fig. 3H) with simple tapered palp, not reaching to distal margin of basal endite; basal endite lamellar, elongate, medial margin densely fringed with setae; coxal endite stout; exopod well developed, caridean lobe large, broad, tapering distally; epipod vestigial. Second maxilliped (Fig. 3I) with well-developed exopod, with numerous long plumose setae on distal half, and shorter, thicker setae placed about quarter distance from base; small rounded epipod with multilamellar podobranch. Third maxilliped reaching beyond antennular peduncle, stout with small single arthrobranch (Figs 1, 3J); exopod well developed, with long setae distally; epipod strap shaped.

Pleurobranchs present on pereiopods 1-5, exopods on maxillipeds only, and epipods on all maxillipeds and pereiopods 1-4.

First pereiopod short, robust, chelate (Fig. 3K); chela about 1.5 × carpus length, palm of chela swollen, posteriorly expanded, longer than dactylus; fingers robust, tapering, curved, distally with tuft of sparse setae, claw-like tip; carpus expanded distally, distodorsal margin deeply excavate; merus subequal to chela, about 1.5 × carpus length, slightly broadened distally; coxa stout, with strap-like distally hooked epipod and one setobranch. Second pereiopod (Fig. 3L) with chela, chela about 0.9 × carpus length; palm feebly expanded proximally, faintly bowed; dactylus as long as palm length, unarmed, otherwise similar to first pereiopod; fingers subequal, stout, pigmented distally, fixed finger similar to dactylus; carpus feebly expanded distally, distodorsally feebly excavate; merus about 1.5 × carpus length; coxa similar to that of first pereiopod, with strap-like epipod and one setobranch. Third pereiopod very robust (Figs 2D, 4A); dactylus stout, tapering distally, unguis demarcated with fringe of setae, ventral margin with 9 stout, moveable spinules (Fig. 2E);

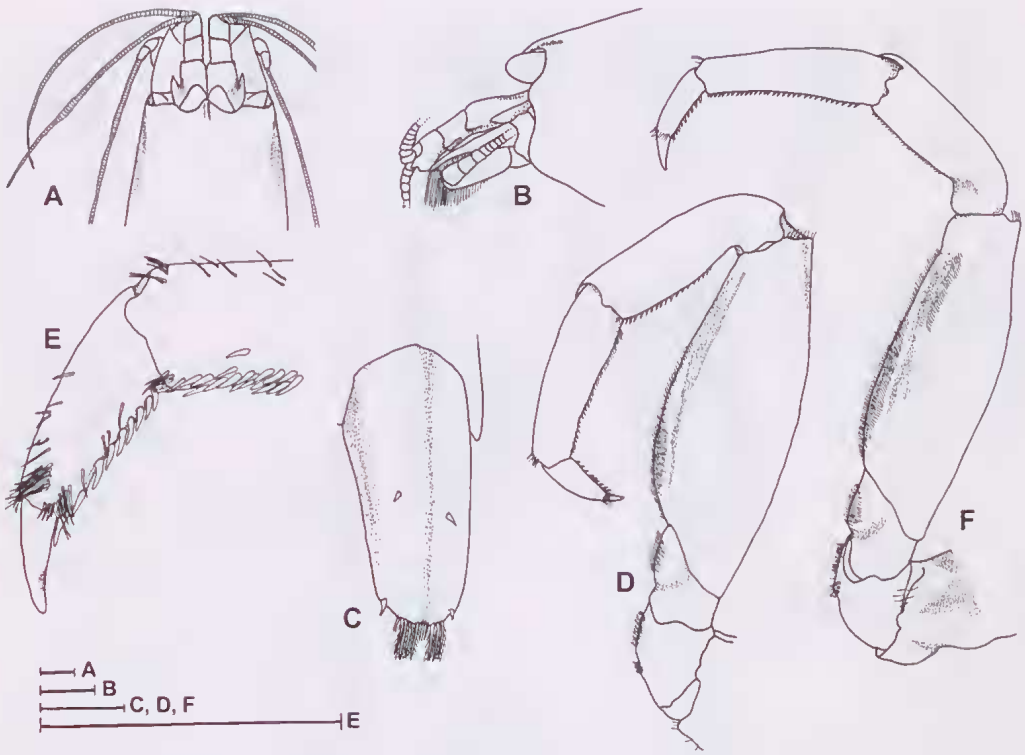

FIG. 2. *Pycnisia bunyip*, sp. nov., ♀ holotype (QMW26722): A, dorso-frontal view of carapace; B, latero-frontal view of carapace; C, dorsal view of telson; D, left third pereiopod; E, daetylus of left third pereiopod; F, left fourth pereiopod. Scale bars = 1mm.

propodus about 0.9× (range 0.8-1.1 in paratypes) carpus length, slightly bowed, ventral margin with numerous short, stout, moveable spinules; carpus slightly convex ventrally, with single row of setae medially; merus very robust, about 1.9× (range 1.9-2.7 in paratypes) carpus length, oval in section, 2.8× (range 3.8-5.0 in paratypes) longer than greatest width, dorsal and ventral margins convex; ischium short, distal half of ventral border with rounded patch of dense setae; basis short, robust; coxa robust, with strap-like distally hooked epipod and one setobranch. Fourth pereiopod (Figs 2F, 3B) robust as third pereiopod; propodus subequal to carpus (range 1.0-1.3 in paratypes); merus about 1.9× (range 2.0-2.9 in paratypes) carpus length, 2.9× (range 3.3-7.0 in paratypes) longer than greatest width; otherwise similar to third pereiopod. Fifth perciopod slender (Fig. 4C); dactylus slender, feebly tapering distally, unguis faintly demarcated; propodus about 1.7× (1.6 in paratype QMW26725) carpus length, ventrolateral border with row of stout setae; carpus with small distodorsal lobe; merus about 1.5× (1.7 in paratype QMW26725) carpus length; ischium and basis normal; coxa with two setobranchs but without epipod.

First pleopod (Fig. 4D) with slender, distally attenuated endopod. Second (Fig. 4E) to fifth pleopods similar, endopod not attenuated, with appendix interna. Uropodal protopod with posterolateral angle acute (Fig. 4F); diaeresis of exopod distinct, but incomplete; endopod slightly shorter than exopod.

Color In Life. Photographs show a yellow carapace with colour extending into anterior abdomen, probably representing the hepato-pancreas, and possibly ovary, beneath. Abdomen mostly transparent.

REMARKS. This new species, *P. bunyip*, is similar to *P. raptor* in having reduced eyes without pigmentation, a small rostrum, and robust pereiopods. However, in *P. bunyip* the rostrum reaches slightly past the level of orbital angle (shorter in *P. raptor*), and the telson has only one or two pairs of dorsal spines and one pair

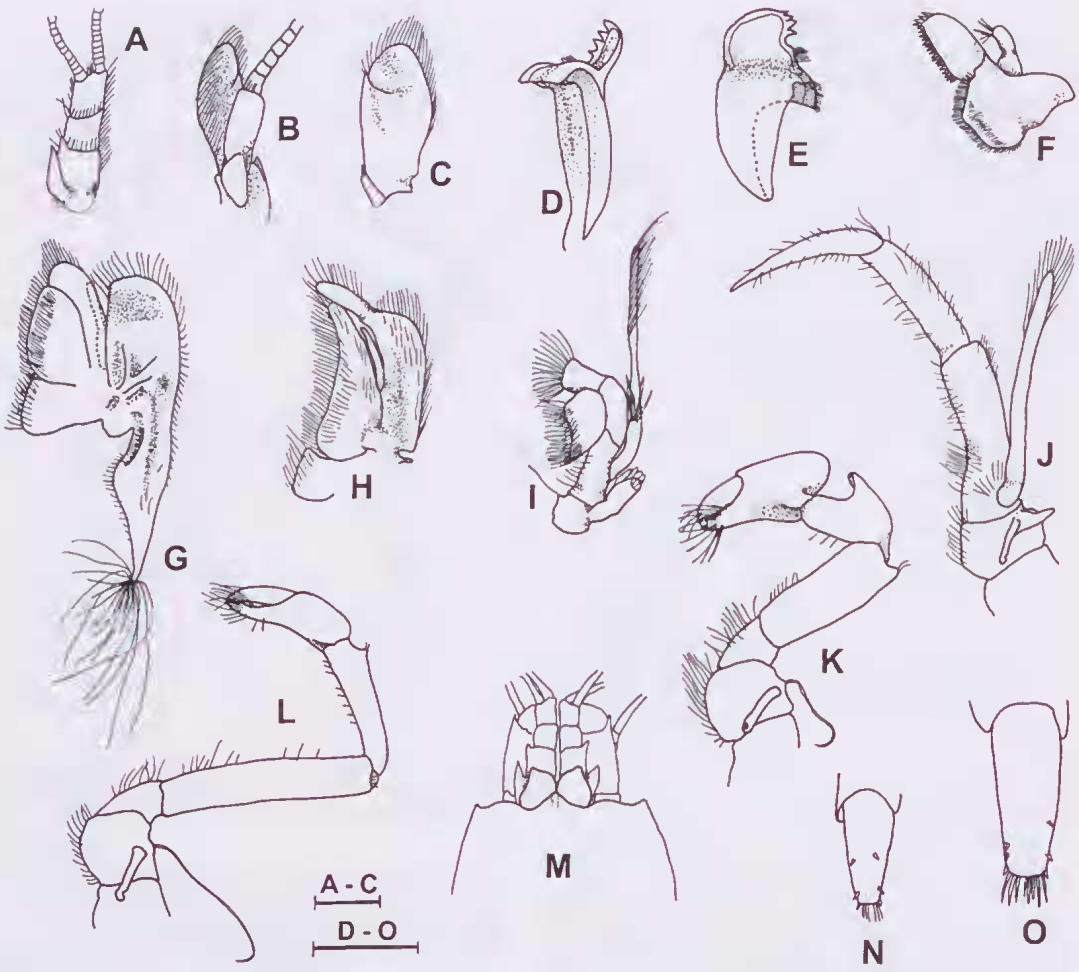

FIG. 3. *Pycnisia bunyip*, sp. nov. A-L, ♀ paratype (QMW26725): A, left antennule; B, ventral view of left antenna; C, scaphoeerite of left antenna; D, ventral view of mandible; E, dorsal view of mandible; F, left maxillule; G, left maxilla; H, first maxilliped; I, second maxilliped; J, third maxilliped; K, first pereiopod; L, second pereiopod. M-N, ♀ paratype (QMW26723): M, dorso-frontal view of carapace; N, dorsal view of telson. O, ♀ paratype (QMW26724), dorsal view of telson. Scale bars = 1mm.

of subdorsal spines (four pairs of dorsal spines and one pair of subdorsal spines in *P. raptor*).

The setobranch and multidenticulate seaphognathite setae are known to have an important gill-cleaning role in some caridean shrimps (Bauer, 1981, 1989; Suzuki & McLay, 1998). *Pycnisia bunyip* has one or two setobranchs on the coxae of the pereiopods, and 20 multidentieulate scaphognathite setae similar to other atyid speeies. Four Australian troglophilie shrimps, *Parisia gracilis*, *P. unguis*, *Pyeneus morsitans* and *Pycnisia raptor*, also have setobraneh and several long multidentieulate setae elearly belonging to the seaphognathite (Bruee, 1992; Holthuis, 1986; Williams, 1964). These speeies, along with *P. bunyip*, are thought to have passive gill-eleaning mechanisms as oeeur in other atyid speeies. However, *Stygiocaris lancifera* and *S. stylifera* have no long setae on the posterior portion of the seaphognathite (Holthuis, 1960). These two speeies are thought to have either an aetive gill-eleaning meehanism using a pereiopod setal brush, or a different form of passive gill-eleaning using branehiostegal setae (Bauer, 1998; Batang & Suzuki, 2000). Future study of gill-eleaning mechanisms of eavernieolous shrimps may be useful for

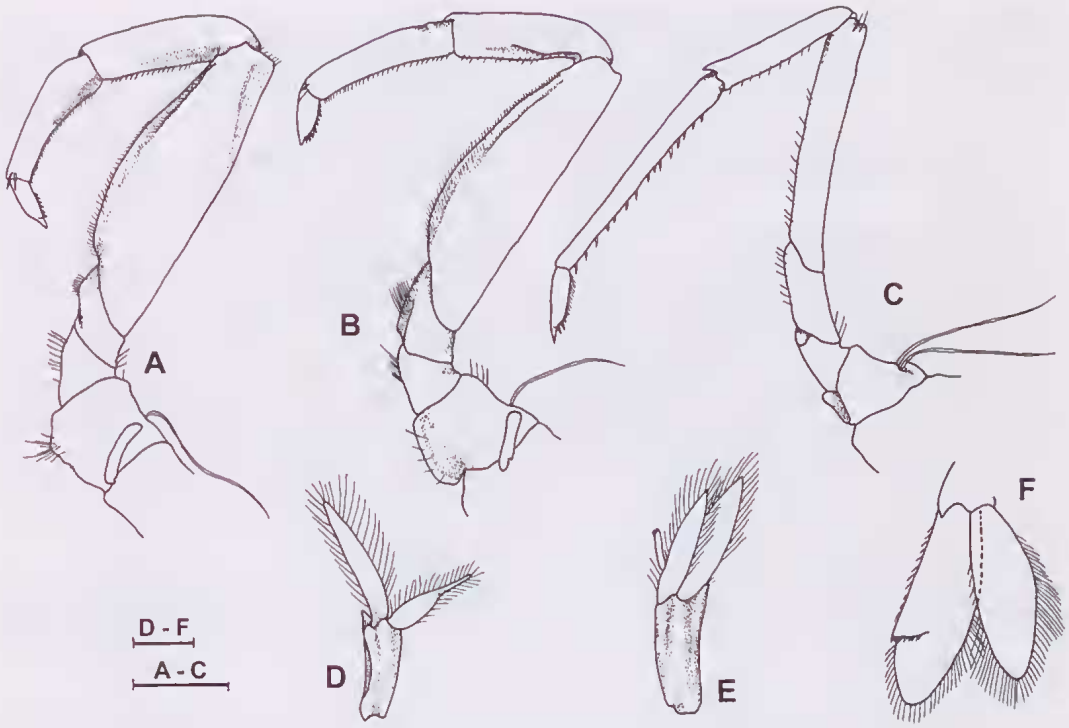

FIG. 4. *Pycnisia bunyip*, sp. nov., ♀ paratype (QMW26725): A, third pereiopod; B, fourth pereiopod; C, fifth pereiopod; D, first pleopod; E, second pleopod. Scale bars = 1mm.

understanding adaptive selection pressures and phylogenetic relationships.

DISTRIBUTION. Only known from the type locality.

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